

## Exhibit 4

# Media Violence Exposure in Aggressive and Control Adolescents: Differences in Self- and Parent-Reported Exposure to Violence on Television and in Video Games

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**A**

The purpose of present study was to investigate differences in media violence exposure between groups of adolescents with and without Disruptive Behavior Disorders with Aggressive Features, using a case-controlled design and multimethod assessment. Samples of 27 adolescents aged 13-17 with Disruptive Behavior Disorder with Aggressive Features and 27 age-gender-IQ matched controls completed a semistructured interview about exposure to violence on television and video games; parents completed a corresponding questionnaire measure. Moderate intercorrelations were found between most self- and parent-report television and video game violence exposure measures. Compared to control adolescents, adolescents with Disruptive Behavior Disorder with Aggressive Features had higher aggregate media violence exposure, higher exposure to video game violence, and higher parent-reported exposure to television violence. Results show that adolescents and parents agree about the adolescent's level of media violence exposure, that exposure to violence on television tends to be accompanied by exposure to violence in video games, and that the association between media violence exposure and Disruptive Behavior Disorder with Aggressive Features is not due to a spurious effect of gender or IQ. *Aggr. Behav.* 31:201-216, 2005. © 2005 Wiley-Liss, Inc.

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The purpose of the present study was to investigate differences in exposure to media violence between groups of adolescents with and without a history of aggressive and disruptive behavior. The relationship between media violence exposure and aggressive behavior has been the subject of social, political, and scientific attention for decades. Experimental studies

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of exposure to violent television and video games have shown short-term increases in aggressive behavior in children, adolescents, and adults, and correlational studies suggest a longer-term association between media violence exposure and aggressive behavior in the natural environment [Anderson and Bushman, 2001, 2002; Anderson and Dill, 2000]. The importance of studying the relationship between media violence exposure and aggressive behavior has increased with the evolution of more complex and realistic media formats (e.g., from television to video games), which has raised concerns about the applicability of early studies of television-based media violence exposure to modern-day television special effects and realistic interactive video games. Home-based video games, for example, have increased dramatically in sophistication, realism, and prevalence during the past 20 years. This growth and change in media formats has led to calls for more modern research on the impact of media violence exposure in general and video game violence in particular [Anderson and Bushman, 2001; Dill and Dill, 1998].

Experimental and correlational studies of video game violence exposure have typically shown a significant positive relationship with aggression in samples of children and adolescents [Anderson and Bushman, 2001]. There are good reasons, such as the participant-nature of video-game playing as compared to the more passive nature of viewing television [Dill and Dill, 1998], to hypothesize that video game violence exposure may be more strongly related to aggressive behavior than television violence exposure. Although one early experimental study [Silvern and Williamson, 1987] found no difference between the impact of video game vs. televised violence on short-term aggressive behavior in children (both types of media violence were related to short-term aggressive behavior), there has been a considerable increase in the realism and magnitude of violence in video games since that study was conducted. Surprisingly, however, there has been very little recent study comparing television and video game exposure [Anderson and Bushman, 2001].

Despite the need for research with more modern media types in general and video games in particular, correlational studies of exposure to televised and video game violence are complicated by several methodological issues. First, in order to generalize to the full range of aggressive behavior, correlational studies must target aggressive behavior ranging from transient and/or mild aggression to serious and chronic aggressive behavior. Much of the current research literature concerning the media violence exposure-aggression relationship has focused on transient aggressive behavior (e.g., laboratory-based measures of aggression immediately following exposure to a violent video) or on differences in aggressive behavior within the broad normal range. For example, studies of children and adolescents frequently rely on samples drawn from the school population [e.g., Rowe and Herstand, 1986; Singer et al., 1998] or define high aggression based on differences in scores on self- or adult-rating measures of aggressive behavior [Josephson, 1987]. These studies have documented a clear relationship between aggression and violent media exposure [Anderson and Bushman, 2001, 2002; Bushman and Anderson, 2001], and there is evidence that laboratory findings involving aggression are consistent with behavior in the external environment [Anderson and Bushman, 1997]. However, less research has been focused on groups of highly aggressive individuals. Of greatest concern are children and adolescents with sufficiently high levels of aggression to qualify for psychiatric diagnosis; this diagnosis would suggest that their rule-breaking and aggression are present at levels that are debilitating to themselves and possibly dangerous to society. Relatively few studies of media violence exposure include these types of samples [Gadow and Sprafkin, 1993; Grimes et al., 1997].

A second major methodological issue in correlational studies is the need to control for potential confounding variables. In the case of aggressive behavior and media violence exposure, gender and intelligence may be two critical confounding variables [Griffiths, 1999]. Rule-breaking and aggressive behavior, for example, tend to be more prevalent in males [American Psychiatric Association, 1994] and in individuals with lower IQ [Huesmann et al., 1987; Schonfeld et al., 1988]. Furthermore, boys may show a greater preference for television and video game violence [Dominick, 1984]. As a result of this association, a relationship between media violence exposure and aggressive behavior may simply reflect the greater tendency of males to be aggressive and to seek out higher media violence exposure. In that case, the media violence exposure-aggression relationship would be a result of the association of both with gender and would not reflect an unmediated correlation. Similarly, it could be argued that the relationship between media violence exposure and aggression simply reflects a separate association of each with lower IQ. Hence, studies of media violence exposure in samples that include highly aggressive individuals must account for gender and IQ in order to avoid a confounding relationship with aggression [e.g., Gadow and Sprafkin, 1993].

Perhaps one of the most difficult methodological issues in correlational studies of media violence exposure is measurement. Unlike experimental studies, which can closely regulate the type and amount of media violence exposure, correlational studies emphasize the individual's media violence exposure in the uncontrolled, complex arena of day-to-day life. Various methods have been used to quantify media violence exposure in the real-world environment, with most relying on self-report questionnaires that ask about typical television viewing amount and preferences [e.g., Rowe and Herstand, 1986; Singer et al., 1998]. Self-report methods are frequently used for measurement of both media violence exposure and aggressive behavior, raising the possibility of method bias in results [e.g., Singer et al., 1998]. Very few studies use interview methods to obtain a more controlled and detailed index of media violence exposure, and still fewer ask for corroborating information from caretakers [see Gadow and Sprafkin (1993) for an example of this type of study]. Such a multimethod-multitrait approach to assessment, which incorporates observer-report with self-report, is recommended by many authors in order to provide more valid data about measures of behavior [Holmbeck et al., 2002].

Although different studies have addressed the relationship between television and video game media violence exposure, no single study has addressed both television and video game media violence exposure in an adolescent sample while accounting for the key methodological issues outlined earlier. In fact, there is a need for more research specifically focused on violence in modern video games [especially in the context of exposure to televised violence; see Anderson and Bushman, 2001], an increasingly important topic as more realistic video game platforms are developed and marketed. Hence, there is a strong need for research concerning the association between exposure to violent video games (in the context of the more established television medium) and the behavior of adolescents. The purpose of the present study was to investigate differences in reported exposure to violence on television and in video games between groups of adolescents with and without Disruptive Behavior Disorders with Aggressive Features using a correlational, case-controlled design. The comparison groups were matched on age, gender, and IQ in order to avoid confounding by these variables, and a multimethod approach to measurement was used to increase the validity of measurement of media violence exposure. Two secondary purposes of the study were to investigate the relationship between exposure to violence on television and exposure

to violence in video games and to investigate the relationship between self-reported and parent-reported media violence exposure.

## METHOD

### Participants

The participants were 54 adolescents aged 13–17 years, with either a Disruptive Behavior Disorder (Disruptive Behavior Disorder with Aggressive Features) or no psychiatric (No Diagnosis Control) diagnosis. Adolescents in the Disruptive Behavior Disorder with Aggressive Features group ( $N = 27$ ) met Diagnostic and Statistical Manual of Mental Disorders - Fourth Edition [American Psychiatric Association, 1994] criteria for either Oppositional-Defiant Disorder or Conduct Disorder and had at least one significant recurrent symptom of aggressive behavior toward people, animals, or property within the past six months, as defined in Conduct Disorder diagnostic criteria. Adolescents in the Control group ( $N = 27$ ) were required to have no Diagnostic and Statistical Manual of Mental Disorders - Fourth Edition diagnosis and no contact with a mental health professional for treatment of a behavioral/emotional problem within the past three years. Adolescents were excluded from the study if they had an IQ of less than 70, current diagnosis of Major Depressive Disorder, or lifetime diagnosis of Bipolar Disorder or Schizophrenia.

Individuals in the Disruptive Behavior Disorder with Aggressive Features and Control study subgroups were matched on age ( $+/- 2$  years; Disruptive Behavior Disorder with Aggressive Features mean age = 14.1 [ $SD = 1.2$ ], Control = 14.4 [ $SD = 1.3$ ];  $t(52) = 0.88$ ,  $p > 0.10$ ; Cohen's  $d$  [effect size] = 0.24), gender (21 male, 6 female per group), and IQ ( $+/- 0.5$  population standard deviations [7 points; Disruptive Behavior Disorder with Aggressive Features mean IQ = 96.7 [ $SD = 10.6$ ], Control = 98.8 [ $SD = 8.6$ ];  $t(52) = 0.79$ ,  $p > 0.10$ ;  $d = 0.22$ ). The subgroups also did not differ on race (11 Caucasian in each group, with 13 African-American in the Disruptive Behavior Disorder with Aggressive Features group, 14 African-American in the Control group, 3 mixed-race in the Disruptive Behavior Disorder with Aggressive Features group, and 2 mixed-race in the Control group;  $X^2(1)$ [aggregating African-American and mixed-race groups into a single cell to meet chi-square assumptions] = 0.00;  $d = 0.00$ ). Caregiver questionnaires were completed by individuals identifying themselves as primary caregivers for the adolescents (50 mothers, 3 fathers, 1 grandmother). Caregiver education was used as a rough indication of socioeconomic status; study subgroups did not differ on this variable (mean = 13.3 [ $SD = 2.1$ ] for Disruptive Behavior Disorder with Aggressive Features and 14.2 [ $SD = 2.0$ ] for Control,  $t(52) = 1.67$ ,  $p > 0.10$ ;  $d = 0.46$ ).

### Procedure

The data for the present study were obtained as part of a larger psychological assessment battery during Visit 1 of a two-visit protocol involving psychological evaluation at Visit 1 and functional magnetic resonance imaging (fMRI) scanning at Visit 2. The protocol for the study was approved by the university's Institutional Review Board, and informed consent was obtained before initiating any study procedures. Participants and parents were compensated \$150 total for attendance at both visits. All tests and clinical interviews were administered at Visit 1 by experienced Bachelor's- and Master's-level technicians who were supervised by a doctoral-level clinical psychologist.



Participants for both the Disruptive Behavior Disorders with Aggressive Features and the Control groups were recruited using several methods, including flyers posted at local schools, clinics, and community organizations, as well as requests that professionals and teachers notify families of the possibility of participating in the study. One hundred eighty-three potential participants called for information about the study. Based on phone screening, 38 met eligibility requirements for the Disruptive Behavior Disorder with Aggressive Features group and 54 were eligible for the Control group. Of the 38 eligible for the Disruptive Behavior Disorder sample, 29 attended testing sessions at the research site; 8 failed to show and/or respond to scheduling calls; and 1 refused participation. Of the 54 eligible for the Control sample, 43 attended testing sessions; 5 failed to show and/or respond to scheduling calls; 3 refused participation; and 3 were not able to be tested during the time frame of the study. For the matching procedure, subjects in the Disruptive Behavior Disorder sample were matched to the same sex/same age ( $\pm 2$  years) Control subject with the closest IQ value. Two subjects in the Disruptive Behavior Disorder sample could not be matched, resulting in a sample size of 27 in that group (with 27 corresponding matched Controls, for a total sample size of 54).

## Measures

**Kiddie-SADS.** The Kiddie-SADS [Kaufman et al., 1996] is a semistructured diagnostic interview based on the Diagnostic and Statistical Manual of Mental Disorders - Fourth Edition [American Psychiatric Association, 1994]. Kiddie-SADS items consist of flexible probes and rating guidelines, which correspond to Diagnostic and Statistical Manual of Mental Disorders - Fourth Edition symptoms and allow ratings based on quantifiable criteria. Individual symptom ratings are aggregated into major Diagnostic and Statistical Manual of Mental Disorders - Fourth Edition diagnostic categories. In the present study, only the Kiddie-SADS Semistructured Interview Behavioral Disorders module was administered to parents as a measure of Attention-Deficit/Hyperactivity Disorder, Oppositional-Defiant Disorder, and Conduct Disorder diagnoses. In addition, an Aggressive Features designation was made based on parent endorsement of one of the nine Conduct Disorder symptoms involving aggression to people or animals or destruction of property.

**Adolescent Symptom Inventory - 4.** The Adolescent Symptom Inventory - 4 [Gadow and Sprafkin, 1998] is a 120-item, parent-completed questionnaire of adolescent behaviors based on Diagnostic and Statistical Manual of Mental Disorders - Fourth Edition diagnostic criteria. Adolescent Symptom Inventory - 4 items cluster into subscales corresponding to Diagnostic and Statistical Manual of Mental Disorders - Fourth Edition Axis I diagnoses, including Attention-Deficit/Hyperactivity Disorder, Oppositional-Defiant Disorder, Conduct Disorder, Generalized Anxiety Disorder, Specific Phobia, Posttraumatic Stress Disorder, Somatization Disorder, Social Phobia, Separation Anxiety Disorder, Schizophrenia, Major Depressive Disorder, Dysthymic Disorder, Bipolar Disorder, Anorexia Nervosa, and Bulimia Nervosa. Adolescent Symptom Inventory - 4 "subscales" consisting of single screening items (Panic Attack, Obsessions, Compulsions, Motor Tics, Vocal Tics, Enuresis, Encopresis) were not used for screening in the present study because of reliability and validity weaknesses of single-item scales, particularly for diagnostic discriminant validity [Gadow and Sprafkin, 1998]. Symptom count scores for each Adolescent Symptom Inventory - 4 subscale (Diagnostic and Statistical Manual of Mental Disorders - Fourth Edition diagnostic category) are derived by counting the number of items endorsed by the parent at

a level consistent with a clinical level of concern [typically a rating of “often” or “very often”; Gadow and Sprafkin, 1998]. The symptom count scores are then compared to Diagnostic and Statistical Manual of Mental Disorders - Fourth Edition required symptoms to determine if screening criteria are met for the disorder. Although the Adolescent Symptom Inventory – 4 is not a substitute for the detail and expertise of a clinical interview, it yields scores that provide screening information about the presence and absence of Diagnostic and Statistical Manual of Mental Disorders - Fourth Edition diagnoses, and Adolescent Symptom Inventory – 4 scores have been shown to correspond adequately to actual Diagnostic and Statistical Manual of Mental Disorders - Fourth Edition diagnoses [Gadow and Sprafkin, 1998]. In the present study, the Adolescent Symptom Inventory – 4 was used to screen for diagnoses of Generalized Anxiety Disorder, Specific Phobia, Posttraumatic Stress Disorder, Somatization Disorder, Social Phobia, Separation Anxiety Disorder, Schizophrenia, Major Depressive Disorder, Dysthymic Disorder, Bipolar Disorder, Anorexia Nervosa, and Bulimia Nervosa.

**Media Exposure Measure.** The Media Exposure Measure is a semistructured self-report adolescent interview and parent questionnaire measure of the adolescent’s television and video game viewing/playing habits, which was developed as a measure of media violence exposure for the present study. The Media Exposure Measure has three sections: Self-Report Past Week, Self-Report Past Year, and Parent-Report Past Year.

The Self-Report Past Week section is designed to provide a very detailed and specific account of television and video game use during the past week. It consists of an interview during which a series of prompts are used to remind the adolescent of key activities associated with each day of the past week. Then, using the prompts to orient the adolescent to each day, the interviewer asks the adolescent to recall television shows and video games viewed/played on each day of the past week. For each television show or video game, the adolescent reports the duration (number of minutes viewed/played) of the show/game as well as whether the show/game involved “injury” (defined as an actual video depiction of a person being injured) or “graphic injury” (defined as an actual video depiction of an injury showing blood, loss of body parts, or similar graphic physical damage). Separate total duration measures (in minutes) for injury and graphic injury are derived for television and video games by adding the duration values of all shows/games that depicted injury and the duration values of all shows/games that depicted graphic injury. Correlations between the total duration measures of exposure to injury and the total duration measures of exposure to graphic injury were very high within each medium ( $r = 0.85$  for television and  $r = 0.54$  for video games, both  $p < 0.001$ ), indicating that adolescents who viewed injury on television or video games were also very likely to view graphic injury in the same medium. Therefore, a summary (time) measure of exposure to violent television (Television-Past Week-Self) and video games (Video Games-Past Week-Self) was derived by adding the duration values of all shows/games that depicted injury and the duration values of all shows/games that depicted graphic injury.

The second section of the Media Exposure Measure, the Self-Report Past Year section, consists of an interview with the adolescent, who is asked for an estimate of the average number of hours per week over the past year that he or she watched television shows of any type (Total Television Exposure) and played video games of any type (Total Video Game Exposure), using a 1 (not at all) to 10 (more than 35 hours a week or average of 5 hours a day) Likert scale (interim values on the scale progress in increasing increments, with a value of ‘2’ corresponding to less than an hour a week [average of less than 10 minutes a day], ‘3’ to 1–2 hours a week [10–15 minutes a day], ‘4’ to 2–4 hours a week [15–30 minutes a day], ‘5’ to

4–7 hours a week [1/2 hour to 1 hour a day], and values of 6 to 10 increasing in 7 hour/week increments after that [adolescents are also provided with corresponding values for average hours/day for each rating value]). The Exposure values are then multiplied by estimates (on a 1 [rarely] to 4 [most of the time] scale) of what proportion of the Exposure involved injury and graphic injury, in order to obtain weighted indices of exposure to shows/games that depict injury and graphic injury, respectively. The weighted indices for injury and graphic injury are then summed to provide separate overall measures of media violence exposure for television (Television-Past Year-Self) and video games (Video Games-Past Year-Self). As with the past week section, correlations between the weighted index measures of exposure to injury and the weighted index measures of exposure to graphic injury were very high within medium ( $r = 0.75$  for television and  $r = 0.86$  for video games, both  $p < 0.001$ ) and strongly supported their combination into these aggregate television and video game self-report past year media violence exposure indices.

The final section of the Media Exposure Measure, the Parent-Report Past Year section, mirrors the adolescent self-report past year section and is completed by the parent in a questionnaire format. Like the Self-Report Past Year section, it yields media violence exposure indices for television (Television-Past Year-Parent) and video games (Video Games-Past Year-Parent). Also, like the other Media Exposure Measure sections, correlations between the weighted index measures of exposure to injury and the weighted index measures of exposure to graphic injury ( $r = 0.84$  for television and  $r = 0.89$  for video games, both  $p < 0.001$ ), strongly supported their combination into these aggregate television and video game media violence exposure indices.

In this study, the six Media Exposure Measure indices (Television-Past Week-Self, Video Games-Past Week-Self, Television-Past Year-Self, Video Games-Past Year-Self, Television-Past Year-Parent, and Video Games-Past Year-Parent) were used as measures of past exposure to media violence.

**Wechsler Abbreviated Scale of Intelligence.** The Wechsler Abbreviated Scale of Intelligence (Two Subtest Form) is a brief test of intellectual ability based on the Vocabulary and Matrix Reasoning subtests of longer Wechsler Intelligence Scales [Psychological Corporation, 1999]. The Wechsler Abbreviated Scale of Intelligence yields separate T-scores for verbal ability (Vocabulary subtest, a measure of verbal definitions of single words) and nonverbal ability (Matrix Reasoning subtest, a measure of nonverbal logical reasoning and visual-spatial skills), as well as an overall IQ score. The Wechsler Abbreviated Scale of Intelligence Full Scale IQ score has been shown to correspond closely to longer IQ tests and was used as a measure of global intellectual ability in order to match the subsamples.

## RESULTS

### Sample Diagnoses

As expected, no Control subject met criteria for Diagnostic and Statistical Manual of Mental Disorders - Fourth Edition diagnosis on either the Kiddie-SADS or Adolescent Symptom Inventory - 4. Kiddie-SADS interviews indicated that most ( $N = 23$ ) of the Disruptive Behavior Disorder with Aggressive Features sample met criteria for Conduct Disorder, while the remainder ( $N = 4$ ) met Oppositional-Defiant Disorder criteria. Over half ( $N = 15$ ) of the Disruptive Behavior Disorder with Aggressive Features sample met criteria for Attention-Deficit/Hyperactivity Disorder on the Kiddie-SADS ( $N = 7$  for Predominantly



Inattentive Type and  $N = 8$  for Combined Type). On the Adolescent Symptom Inventory – 4, 16 adolescents in the Disruptive Behavior Disorder with Aggressive Features sample did not screen positive for any other Diagnostic and Statistical Manual of Mental Disorders - Fourth Edition diagnosis, while 9 met screening criteria for either a Dysthymic Disorder ( $N = 6$ ) or an Anxiety Disorder (e.g., Generalized Anxiety Disorder, Panic Attacks, Social Phobia, Posttraumatic Stress Disorder;  $N = 6$ ). Five subjects screened positive for Somatization Disorder (1 comorbid with Dysthymic Disorder, 3 comorbid with Anxiety Disorder), and 2 screened positive for an Eating Disorder (one comorbid with Anxiety Disorder [a detailed table of Adolescent Symptom Inventory – 4 screening results and comorbidities is available from the authors]). Four subjects (three with comorbid Dysthymic Disorder and one with comorbid Panic Attacks) screened positive on the Adolescent Symptom Inventory – 4 for diagnoses that were considered potentially exclusionary for study participation (Major Depressive Disorder and Bipolar Disorder). In these cases, follow-up questioning with the parent and subject using full Diagnostic and Statistical Manual of Mental Disorders - Fourth Edition criteria indicated that the subjects did not actually have a Bipolar Disorder or a current Major Depressive Episode.

### **Media Violence Exposure and Diagnostic Group**

During the past week, subjects with Disruptive Behavior Disorder with Aggressive Features reported watching an average of 757 total minutes (shows including and not including injury) of television ( $SD = 460$ ), as compared to 667 total minutes of television for those in the Control sample ( $SD = 338$ ). The groups did not differ significantly on self-reports of the total amount of television watched during the past week ( $t(52) = 0.81$ , ns; Cohen's  $d$  [effect size] = 0.22). On the other hand, subjects with Disruptive Behavior Disorder with Aggressive Features reported watching an average of 385 ( $SD = 291$ ) minutes of television during the past week, in which some injury was portrayed and 227 ( $SD = 276$ ) minutes of television in which some graphic injury was portrayed, as compared to 213 ( $SD = 182$ ) and 113 ( $SD = 134$ ) minutes (respectively) for Controls. The groups differed significantly in the injury minutes ( $t(52) = 2.59$ ,  $p < 0.02$ ;  $d = 0.71$ ) and showed a trend for graphic injury minutes ( $t(52) = 1.93$ ,  $p < 0.06$ ;  $d = 0.53$ ). During the past year, subjects with Disruptive Behavior Disorder with Aggressive Features self-reported watching an average of 2–3 hours a day of television (7.7 [ $SD = 2.0$ ] on the 1–10 time-based Likert scale), while the Control sample also averaged 2–3 hours a day (7.5 [ $SD = 1.4$ ];  $t(52) = 0.48$ , ns;  $d = 0.13$ ). The mean rating for frequency of injury in television shows watched was 2.4 ( $SD = 0.7$  and 0.6, respectively, on the 1 to 4 frequency scale) for both the Disruptive Behavior Disorder with Aggressive Features and Control samples ( $t(52) = 0.20$ , ns;  $d = 0.06$ ), while the rating for frequency of graphic injury in television shows watched was 1.9 for both samples ( $SD = 0.8$  for Disruptive Behavior Disorder with Aggressive Features and 0.6 for Controls;  $t(52) = 0.39$ , ns;  $d = 0.11$ ).

There were trends for the Disruptive Behavior Disorder with Aggressive Features group to report more total minutes of exposure to video games (273 [ $SD = 307$ ] vs. 139 [ $SD = 225$ ];  $t(52) = 1.84$ ,  $p < 0.08$ ;  $d = 0.51$ ) and more minutes of exposure to injury in video games (194 [ $SD = 274$ ] vs. 76 [ $SD = 179$ ];  $t(52) = 1.86$ ,  $p < 0.07$ ;  $d = 0.52$ ),<sup>1</sup> although the groups did not

<sup>1</sup>Nonparametric (Mann-Whitney U test) tests of group differences on all media violence exposure variables yielded results very similar to the t-tests in the text, with two exceptions: The test of group differences in self-reported video game injury minutes in the past week reached statistical significance at  $p < 0.05$  on Mann-Whitney U test (as

differ in minutes of exposure to graphic injury in video games during the past week (72 [SD = 129] for Disruptive Behavior Disorder with Aggressive Features vs. 58 [SD = 172] for Control;  $t(52) = 0.33$ , ns;  $d = 0.09$ ). Subjects in the Disruptive Behavior Disorder with Aggressive Features sample reported playing significantly more (1/2 to 1 hour a day on average; mean of 5.2 [SD = 2.3]) video games than those in the Control sample (10–15 minutes a day on average; mean of 3.7 [SD = 2.0];  $t(52) = 2.52$ ,  $p < 0.02$ ;  $d = 0.70$ ) during the past year. Although the groups did not differ on mean ratings for frequency of injury in video games played during the past year (2.8 [SD = 1.1] and 2.4 [SD = 0.9] for the Disruptive Behavior Disorder with Aggressive Features and Control groups respectively;  $t(52) = 1.35$ , ns;  $d = 0.37$ ), there was a trend for individuals in the Disruptive Behavior Disorder with Aggressive Features sample to report more frequency of exposure to graphic injury compared to individuals in the Control group during the past year (2.4 [SD = 1.1] for Disruptive Behavior Disorder with Aggressive Features and 1.9 [SD = 0.9] for Control;  $t(52) = 1.95$ ,  $p < 0.06$ ;  $d = 0.54$ ).

Parents of subjects in both the Disruptive Behavior Disorder with Aggressive Features and Control groups reported that their adolescents watched an average of 2–3 hours a day (7.7 [SD = 1.9 and 1.4, respectively]) of television ( $t(52) = 0.17$ , ns;  $d = 0.05$ ). The mean parent-reported ratings for frequency of injury in television shows watched by the Disruptive Behavior Disorder with Aggressive Features and Control adolescents were 2.7 (SD = 1.1) and 2.0 (SD = 0.7)(respectively;  $t(52) = 3.01$ ,  $p < 0.004$ ;  $d = 0.83$ ), while the ratings for graphic injury were 2.5 (SD = 1.2) and 1.6 (SD = 0.7), respectively ( $t(52) = 3.23$ ,  $p < 0.002$ ;  $d = 0.90$ ). For video games, parents of subjects in the Disruptive Behavior Disorder with Aggressive Features sample reported that their adolescents played between one and two hours a day on average (5.9 [SD = 2.2]), as compared to a mean of 15–30 minutes a day on average (4.8 [SD = 2.4]) for the Control sample ( $t(52) = 1.76$ ,  $p < 0.09$ ;  $d = 0.49$ ). The mean ratings for frequency of injury were 2.6 (SD = 1.0) and 1.7 (SD = 1.0) for the Disruptive Behavior Disorder with Aggressive Features and Control samples, respectively ( $t(52) = 3.08$ ,  $p < 0.003$ ;  $d = 0.85$ ), as compared to graphic injury ratings of 2.3 (SD = 1.1) and 1.6 (SD = 0.8) for the Disruptive Behavior Disorder with Aggressive Features and Control samples ( $t(52) = 2.77$ ,  $p < 0.008$ ;  $d = 0.77$ ).

A MANOVA comparing the Disruptive Behavior Disorder with Aggressive Features and Control samples on the six Media Exposure Measure indices was statistically significant ( $F(6,47) = 4.42$ ,  $p < 0.01$ ). Group comparisons on the Media Exposure Measure indices (Table I) showed that subjects in the Disruptive Behavior Disorder with Aggressive Features sample scored higher on the Television-Past Week-Self, Video Games-Past Year-Self, Television-Past Year-Parent, and Video Games-Past Year-Parent than did subjects in the Control sample. For Video Games-Past Week-Self, there was no significant difference between groups by t-test, but this result may have been obscured by outliers; a nonparametric Mann-Whitney U Test did show a difference between groups on this variable ( $p < 0.04$ ).<sup>1</sup> Only the Television-Past Year-Self index showed no significant differences between groups (Table I).

(footnote continued)

compared to  $p < 0.07$  by t-test). Additionally, the test of group differences in the Video Games-Past Week-Self score (which is a sum of two variables including self-reported video game injury minutes in the past week; Table I) was significant at  $p < 0.04$  (as compared to  $p < 0.17$  by t-test). Other Mann-Whitney U tests produced results equivalent to those in the text, indicating that for all variables except self-reported video game injury minutes in the past week, outliers or nonnormality had a minimal impact on statistical comparisons of groups.

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Variable	Disruptive Behavior Disorder		No Diagnosis Control		t (Cohen's d)
	Mean	SD	Mean	SD	
Media Exposure Measure Past Week-Self Television	612.2	543.3	327.0	307.9	2.37*
Video Games	265.6	329.2	134.4	349.3	0.65
Media Exposure Measure Past Year-Self Television	34.6	16.5	31.9	10.2	1.42
Video Games	28.5	17.4	17.0	11.9	0.39
Media Exposure Measure Past Year-Parent Television	21.2	16.3	11.1	9.4	0.73
Video Games	14.1	13.0	5.1	8.8	0.20
Factor-Derived Media Exposure Measure Scores					2.84**
Media Violence Index	1.34	3.5	-1.34	2.7	0.79
Television-Self Violence	0.41	2.0	-0.41	1.2	2.79**
Television-Parent Violence	0.36	1.1	-0.36	0.7	0.77
Video Game Violence Factor	0.93	2.4	-0.93	1.9	2.98**
					0.83
					3.15**
					0.87
					1.82 <sup>a</sup>
					0.50
					2.79**
					0.77
					3.16**
					0.88

Note: Factor-Derived Media Exposure Measure scores are based on sums of z-scores for constituent variables. df = 52 for all t-tests.

<sup>a</sup>p < 0.10; \*p < 0.05; \*\*p < 0.01.

### **Relationship Between Self- and Parent-Report of Media Violence Exposure on Television and Video Games**

Correlations between the Media Exposure Measure indices showed moderate to strong relationships between past week and past year self-report ratings within the same media type (television or video games) (Table II). In addition, video game and television Media Exposure Measure scores were significantly correlated within respondent, and there was significant agreement between parent and adolescent on exposure to violence in video games. On the other hand, the parent-rated Media Exposure Measure television score failed to correlate significantly with its corresponding self-report score, suggesting poor adolescent-parent agreement on exposure to violence on television. In general, however, there was a pattern for moderate to strong intercorrelations of all Media Exposure Measure indices, with the exception of the Television-Past Year-Parent score.

In order to better understand the relationships between the Media Exposure Measure indices and to derive higher-order media violence exposure scales from the index scores, the six Media Exposure Measure indices were subjected to a principal components analysis with promax rotation. Scree plots supported one and three factor solutions (a table of results is available from the authors), and the eigenvalues of the first four factors were 2.3, 1.2, 1.0,

**Table II. Correlations Between Television and Video Game Media Violence Exposure Indexes**

	Video Games-Past Week-Self	Television-Past Year-Self	Video Games-Past Year-Self	Television-Past Year-Parent	Video Games-Past Year-Parent
Television-Past Week-Self	0.38**	0.42**	0.31*	0.03	0.07
Video Games-Past Week-Self		0.26 <sup>a</sup>	0.38**	-0.08	0.51***
Television-Past Year-Self			0.43***	0.07	0.12
Video Games-Past Year-Self				0.00	0.36**
Television-Past Year-Parent					0.30*

Note: Values are Pearson correlation coefficients.

<sup>a</sup>p<0.10; \*p<0.05; \*\*p<0.01; \*\*\*p<0.001.

and 0.7, respectively. The one-factor solution (which was named the Media Violence Index because it reflected an aggregate media violence exposure score) featured high loadings (>0.60) of all Media Exposure Measure indices with the exception of Past Year-Television-Parent (loading = 0.14).

For the three-factor solution, the first factor (Video Game Violence Factor) was characterized by high loadings (>0.45) of all video game indices (Video Games-Past Week-Self, Video Games-Past Year-Self, and Video Games-Past Year-Parent). The self-report television indices (Television-Past Week-Self and Television-Past Year-Self) loaded most significantly on the second factor (Television-Self Violence Factor). Finally, the third factor was characterized by a single high-loading of the Television-Past Year-Parent variable (Television-Parent Violence Factor).

In order to derive scores for the factors, each Media Exposure Measure index score was converted to a mean of 0 and standard deviation of 1 (in order to give each variable an equal impact on the variance of the aggregate factor score). The constituent index scores were then summed to create four aggregate factor scores, reflecting the one-factor (Media Violence Index) and three-factor solutions (Video Game Violence Factor, Television-Self Violence Factor, and Television-Parent Violence Factor). All of the aggregate factor scores differed significantly between the groups, with the exception of a trend for Television-Self Violence Factor (Table I).

## DISCUSSION

The results of this study show a relationship between video game and television media violence exposure and an aggressive Disruptive Behavior Disorder diagnosis in adolescents. In doing so, these results replicate and extend findings of prior studies showing greater media violence exposure in children and adolescents with severe aggressive behavior. Consistent with the findings of Gadow and Sprafkin [1993], adolescents with severe aggressive behavior scored higher on media violence exposure indices by both parent- and self-report. Study results also replicate the association between video game-based media violence exposure and aggressive behavior found in adolescents and young adults [Anderson and Bushman, 2001; Anderson and Dill, 2000; Griffiths, 1999]. In addition to replicating these prior findings, however, study results go beyond prior findings in showing that the relationship between



media violence exposure and severe aggressive behavior in adolescents is present even when intelligence, gender, and age are controlled. Additionally, both television and video game media violence exposure were found to be related to aggressive behavior in the same sample. Unlike many prior studies of video games, this study measured both amount of total video game play and amount of aggressive content in video games, showing that (especially for parent-report) aggressive adolescents play a higher proportion of video games involving injury (and particularly graphic injury) regardless of the amount of total video game play. Finally, study results showed that individuals with high exposure to media violence on television are likely to be exposed to high levels of violence in video games.

Unlike most prior studies of media violence exposure and aggressive behavior, this study focused on aggressive behavior in the severe range, by comparing adolescents with and without Disruptive Behavior Disorders with Aggressive Features. Disruptive Behavior Disorders are serious, chronic conditions that predict poor outcome if untreated, and adolescents with aggressive Disruptive Behavior Disorders can be harmful to themselves and to other members of society [American Psychiatric Association, 1994]. Hence, by capturing this range of severity, this study's results apply to the types of severe aggressive behaviors that are typically cited as the major areas of concern in the media violence exposure-aggression relationship. Although at least one prior study [Gadow and Sprafkin, 1993] has studied the relationship between television media violence exposure and aggressive behavior in preadolescent children with severe aggressive behavior, we are not aware of any study that has investigated both video game and television media violence exposure in adolescents diagnosed with aggressive Disruptive Behavior Disorders. The results of this study suggest a relationship between both video game and television media violence exposure and an aggressive Disruptive Behavior Disorder diagnosis in adolescents.

Interestingly, not all measures of media violence exposure showed differences between the study groups. Self-reported exposure to violent video games in the past week showed a significant difference between groups using nonparametric (Mann-Whitney U) tests but not t-tests. This finding suggests that outliers and large within-group variability may have obscured the t-test of this variable. The large standard deviation of this variable relative to its mean supports this hypothesis (Table I). The tendency of this variable to show more within-group variability and to be affected more by outliers is probably a result of the fact that actual video game play over a period of one week is less stable and more susceptible to transient environmental factors (e.g., schedule, access to video games) than is video game play over a period of one year. This hypothesis is supported by the finding of significant differences by t-test in video game media violence exposure by both parent-report and self-report over the past year.

Of the six Media Exposure Measure Indices, only self-reported exposure to violent television over the past year showed no significant difference between groups by nonparametric or t-tests. This finding may be due to problems estimating the proportion of violence present in television shows viewed. Unlike video games, which tend to have a unified and consistent theme throughout their play (e.g., driving, shooting, specific sport), television shows vary more in their specific plot and content from week to week. Inspection of reports of specific television shows watched and video games played suggested that adolescents also tended to watch many different television shows (which presumably varied more in content), while playing only a few different video games. Hence, reporting proportion of violent television over a year may require more guesswork and estimation on

the part of the adolescent. On the other hand, this does not explain the significant differences found between groups on parent-reports of violent television exposure during the past year.

A second key area of study findings is the relationship between exposure to violence on television and video games. Study results showed moderate positive correlations ( $r = 0.30$  to  $0.43$ ) between televised and video game media violence exposure rated by the same individual for the same time duration (week or year). Furthermore, the one-factor solution of the principal components analysis suggested that television and video game media violence exposure (with the exception of parent-rated television media violence exposure) load onto a single higher-order factor. These findings show that subjects who watched violent television were more likely to play violent video games and that media violence in general is related to aggressive diagnosis. On the other hand, the correlations are small enough to suggest that there are also some unique characteristics to media violence exposure on television and video games, and a three-factor solution indicated that video game media violence exposure formed its own factor, cutting across both parent and self-report. Hence, there appear to be both shared and unique components of variance between television and video media violence exposure, and further study of these components may provide more insight into the nature and correlates of media violence exposure. For example, post-hoc analyses showed that the significant between-group differences in the Media Exposure Measure factor-derived scores (see bottom of Table I) for one media type (e.g., video games) remained even when the effects of the other media type (e.g., television) were statistically controlled (partial correlation for Video Game Violence Factor and diagnosis group with Television-Parent Violence Factor partialled out =  $0.40$ ,  $p < 0.003$ ; partial correlation for Television-Parent Violence Factor and diagnosis group with Video Games partialled out =  $0.35$ ,  $p < 0.01$ ). This finding implies that the relationships between the different types of media violence exposure and aggressive behavior are partly independent.

In addition to investigation of the relationship between different types of media violence exposure, this study aimed to better measure media violence exposure by using a multimethod-multitrait approach. Analyses of different ways of measuring media violence exposure showed that adolescents' estimates of media violence exposure over the past year correlated moderately to strongly with more direct, detailed reports of media violence exposure over the past week, supporting the validity of measuring media violence exposure by self-report estimates. Furthermore, adolescent and parent-report of video game media violence exposure showed strong correspondence (Table II) as compared to no correlation for television media violence exposure. The discrepancy between agreement in video game and television media violence exposure may be a result of the nature of these different types of media. Parents are likely to be more aware of their adolescents' video game play because games are concrete items that must be purchased and that consist of cartridges or disks that can be easily seen around the house. Furthermore, adolescents tend to play a smaller variety of video games as compared to the large variety of televised programming. In many cases, violence on television is a usually part of a much longer plotline, while violence on video games tends to recur frequently and to be more obvious to the observer. Hence, parents may be much more reliable and accurate reporters of their adolescents' video game play than of their adolescents' television viewing habits.

Several methodological issues must also be considered in order to accurately interpret the results of this study. First, the study design was correlational, which does not allow for causal conclusions to be drawn. The relationship found in this study between media violence exposure and aggressive behavior could go in either (or both) of two directions because of

this: Aggressive behavior might cause the adolescent to seek more violent media, and/or media violence exposure may be a cause of aggressive behavior. For example, aggressive adolescents may seek out aggressive media as a form of stimulation or as a form of entertainment that is consistent with their beliefs about the world.

Another possibility is that a third variable (other than gender, IQ, or age) may cause both aggressive behavior and media violence exposure. Such potential confounding variables may include hyperactivity-impulsivity, which tends to be associated with aggressive behavior and which may lead to stimulation seeking in the form of media violence exposure. In the present sample, about half (56%) of the Disruptive Behavior Disorder with Aggressive Features sample also met criteria for Attention-Deficit/Hyperactivity Disorder, and post-hoc analyses showed that the 15 adolescents with comorbid Disruptive Behavior Disorder with Aggressive Features and Attention-Deficit/Hyperactivity Disorder scored higher on the Media Violence Index score than the 12 adolescents with Disruptive Behavior Disorder with Aggressive Features alone ( $t(25) = 3.6, p < 0.001$ ). Future research may address the role of hyperactivity/impulsivity more systematically by including a nonaggressive psychiatrically-diagnosed comparison group with a diagnosis such as Attention-Deficit/Hyperactivity Disorder. Nevertheless, in the context of existing experimental and correlational research literature, the results of this study indicate that the media violence exposure-aggressive behavior relationship is not likely to be spurious.

Another methodological issue concerns the measurement of aggression in this sample. While other studies have measured aggression on a continuum, this study looked at severe aggressive behavior in the context of a categorical diagnosis that includes rule-breaking behavior (and usually anger-control problems). Hence, the results of this study pertain more to severe aggressive behavior in the context of chronic oppositionality/rule breaking than to isolated aggressive behavior (without a pattern of rule-breaking) or to a continuum of aggression including aggression within the normal range.

In addition, the measurement of media violence exposure in this study should be considered in interpreting results. The Media Exposure Measure is based on retrospective self-report, as opposed to objective behavioral ratings or electronic monitoring. Therefore, although the past-week Media Exposure Measure uses a detailed, retrospective diary format, all sections of the Media Exposure Measure are potentially susceptible to reporter bias. Attempts were made, however, to reduce the role of this bias by the use of multiple respondents and different ways of measuring media violence exposure (e.g., injury vs. graphic injury, past-week vs. past year). Hence, bias or response set in a certain respondent would not explain the consistent results found across adolescents and parents.

Overall, these results support prior findings of an association between media violence exposure and serious aggressive behavior, suggesting that both video game and television media violence exposure are independently related to aggression in adolescents and that this relationship is not explained by gender, IQ, or age. A moderate relationship was found between media violence exposure on television and media violence exposure in video games, although considerable unique variance also exists in these variables. Parents and adolescents tended to agree on media violence exposure in video games, while differing in estimates of media violence exposure on television. Future research should continue to investigate correlates of media violence exposure, with continued attention to similarities and differences between television and video game media violence exposure. Integration of these findings into major theoretical models [e.g., Anderson and Bushman, 2001] may improve understanding of the correlates and effects of media violence exposure.

Present findings have several potential clinical and policy implications. Given the correlation between exposure to violence on television and violence in video games, as well as the relationship between violence in both types of media and aggressive behavior, adolescents with high exposure to one type of media should be evaluated for exposure to violence in other types of media. Based on past week reports, the average adolescent spent a considerable amount of time playing video games (139 minutes for the Control group and 273 minutes for the Disruptive Behavior Disorder group), and the proportion of injury-related violence (as a part of total exposure time) that adolescents are exposed to in video games appears to be higher than that for television. For example, for the Disruptive Behavior Disorder group (on average) 194 of the 273 video game minutes (71%) included injury themes, as compared to 385 of the 757 television minutes (51%)(similar values for the Control group were 55% and 34%, respectively). Hence, while television may be a greater source of total time and media violence exposure, video games may provide more concentrated exposure to media violence. Additionally, aggressive individuals, who may be more vulnerable to the activating impact of violent media [Bushman, 1995; Josephson, 1987], were shown in this study to be exposed to more violent media than control adolescents, suggesting that they have higher exposure to a possible risk factor for future aggressive behavior. Additional attention to media violence exposure in aggressive adolescents with Disruptive Behavior Disorder therefore appears warranted in both clinical and research settings.

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